GB 1442 03/2010

OPERATING INSTRUCTIONS, MOUNTING & INSTALLATION

S+S REGELTECHNIK

ETF 01 including brass immersion sleeve, nickel-plated
ETF 02 including stainless steel immersion sleeve
Screw-in sensors/immersion temperature sensors

MWTF
Mean value temperature sensor/rod sensor

Congratulations!
You have bought a German quality product.

S+S stands for reliable control technology resulting from certified development and production while employing high-quality materials.

Our products combine easy mounting & installation and precision you feel with long service life in the patented original design.

Guaranteed made in Germany!

PRECISION YOU FEEL. THE ORIGINAL. MADE IN GERMANY.

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THERMASGARD® **ETF 01** including brass immersion sleeve, nickel-plated
THERMASGARD® **ETF 02** including stainless steel immersion sleeve

Screw-in temperature sensors / immersion temperature sensors with passive output

S+S REGELTECHNIK

THERMASGARD® ETF01 and ETF02 with passive output, enclosure made of impact-resistant plastic, snap-on lid and straight protective tube including immersion sleeve. For aggressive media, stainless steel immersion sleeves (ETF02) shall be used. These built-in temperature sensors/immersion temperature sensors are electric contact thermometers, which are installed in piping systems and vessels for temperature measurement in liquids and gases. Applications of these temperature sensors are in piping systems, in heating technology, in storage tanks, in district heating compact stations, in hot and cold-water systems, in oil and lubricant circulation systems, in mechanical, apparatus and plant engineering as well as in the entire industrial sector.

TECHNICAL DATA:

Measuring range: ..... -30...+150 °C
(T_{max} NTC = 150 °C, T_{max} LM235Z = 125 °C)
Sensors/output: ..... see table, passive
(other sensors optional)
Connection type: ..... 2-wire connection
Testing current: ..... ca. 1 mA
Process connection: ..... screwed socked with G 1/2" straight pipe thread
Immersion sleeve: ..... ETF01: brass, nickel-plated,
G 1/2" straight pipe thread, wrench size 22 mm, Ø = 8 mm
ETF02: stainless steel, 1.4571, V4A,
G 1/2" straight pipe thread, wrench size 27 mm, Ø = 8 mm
Protective tube: ..... stainless steel, 1.4571, V4A, Ø = 6 mm
Connecting head: ..... plastic, material polyamide, 30% glass-globe-reinforced,
with snap-on lid, colour pure white (similar RAL9010)
ambient temperature -20/+100 °C
Dimensions: ..... 72 x 64 x 39.4 mm
Cable gland: ..... M16, including strain relief
Electrical connection: ..... 0.14 - 1.5 mm²,
via terminal screws on circuit board
Insulating resistance: ..... ≥ 100 MΩ, at 20 °C (500 V DC)
Max. pressure: ..... ETF01: brass immersion sleeves 10 bar
ETF02: stainless steel immersion sleeves 40 bar
Humidity: ..... < 95% r.H.
Protection class: ..... III (according to EN 60730)
Protection type: ..... **IP 43** (according to EN 60529)

ETF01

ETF02

Type/WG1 - Sensor/Output/EL	50 mm	100 mm	150 mm	200 mm	250 mm	300 mm	400 mm
ETF01/ETF02 Pt100	•	•	•	•	•	•	•
ETF01/ETF02 Pt1000	•	•	•	•	•	•	•
ETF01/ETF02 Ni1000	•	•	•	•	•	•	•
ETF01/ETF02 Ni1000 TK5000, LG-Ni1000	•	•	•	•	•	•	•
ETF01/ETF02 NTC 1,8 kOhm	•	•	•	•	•	•	•
ETF01/ETF02 KTY 81-210, NTC 10k 20k, 30k, 50k, 10k Precon	•	•	•	•	•	•	•
ETF01/ETF02 LM235Z (10 mV/K), KP10	•	•	•	•	•	•	•
Please specify in your order:	Type and length of immersion sleeve e.g. ETF01 Pt100, 150 mm; ETF02 Ni1000, 250 mm						
For special orders please specify:	Type, measuring range, sensor, inserted length						

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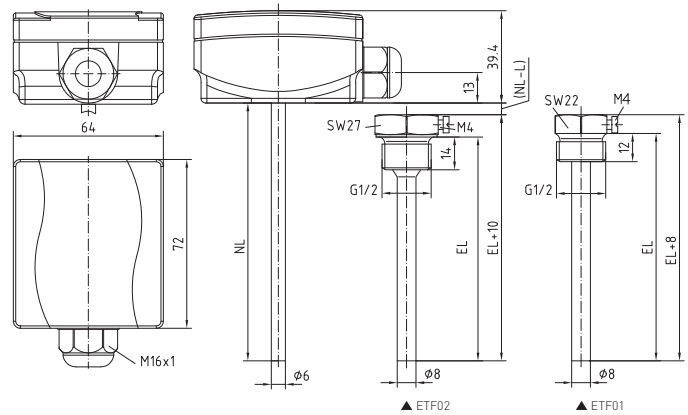
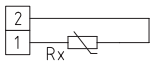
Dimensional drawing

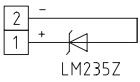
ETF01
ETF02



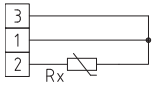
1x two-wire connection
standard



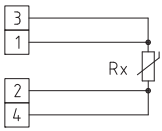
1x two-wire connection
LM235Z (KP10)



1x three-wire connection
(optional)



1x four-wire connection
(optional)



INFORMATION FOR
PLANNING AND INSTALLATION

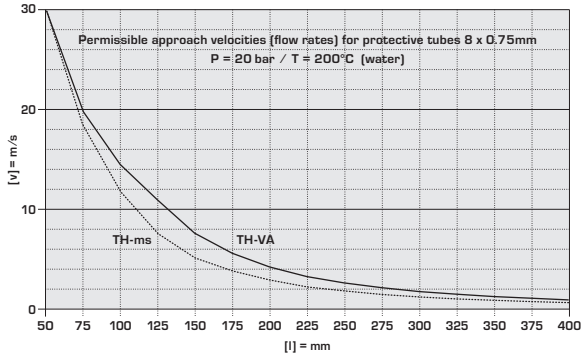
Permissible approach velocities (flow rates) for crosswise approached protective tubes in water.

The protective tube is caused to vibrate by the approaching flow.

If the specified approach velocity is exceeded even by a marginal amount, a negative influence on the lifetime of the protective tube may result (material fatigue).

Please observe the permissible approach velocities for stainless steel protective tubes (see diagram TH-VA) as well as for brass protective tubes (see diagramTH-ms).

Gas discharges and pressure surge must be avoided as such have negative influence on lifetime or damage protective tubes.



THERMASGARD® MWTF

Mean value temperature sensor/rod sensor with passive output

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Sturdy mean value temperature sensor THERMASGARD® MWTF (rod sensor) with passive output, fully active flexible sensor rod for mean value measurement, plastic-coated copper protective tube, terminal box enclosure made of impact-resistant plastic and enclosure cover with quick-locking screws. This sensor is used for the detection of average temperatures (mean values) in gaseous media, e.g. in ventilation and air conditioning ducts as air duct temperature sensor over the entire cross section, or over a defined length. Laid meander-like it detects evenly the surrounding temperature. This mean value sensor is available in lengths of 0.4 m ... 20 m and as a standard is delivered including mounting flange. Mounting clamps MK-05-M may optionally be added to the order as accessories.

MWTF

TECHNICAL DATA:

Measuring range: ..... - 30 ... +80 °C
Sensors/output: ..... see table, passive
Connection type: ..... 2-wire connection
Testing current: ..... ca. 1 mA (wire measuring resistor)
Sleeve: ..... stainless steel, 1.4571, V4A
Rod material: ..... **copper, plastic-coated,** with spring for buckling protection
Sensor and rod dimensions: ..... Ø = 5.0 mm, nominal length NL = 0.4 m, 3 m or 6 m (optional up to 20 m)
Sensor: ..... active over the entire sensor length (averaging)
Installation: ..... observe minimum bending radius of 35 mm and permissible vibration loads ≤ 1/2 g
Connecting head: ..... plastic, material polyamide, 30 % glass-globe-reinforced, **with quick-locking screws,** colour pure white (similar RAL 9010), ambient temperature -20/+80 °C
Dimensions: ..... 72 x 64 x 39.4 mm
Cable gland: ..... M16, including strain relief
Electrical connection: ..... 0.14 - 1.5 mm² via terminal screws on circuit board
Process connection: ..... by mounting flange, plastic, (galvanised steel optional, see accessories) and mounting clamps MK-05-M
Humidity: ..... < 95 % r.H.
Protection class: ..... III (according to EN 60730)
Protection type: ..... **IP 65** (according to EN 60529)

Type/WG1	Sensor/Output	Rod Length
MWTF Pt100/0.4 m	Pt100	0.4 m
MWTF Pt100/3 m	Pt100	3.0 m
MWTF Pt100/6 m	Pt100	6.0 m
MWTF Pt1000/0.4 m	Pt1000	0.4 m
MWTF Pt1000/3 m	Pt1000	3.0 m
MWTF Pt1000/6 m	Pt1000	6.0 m
MWTF Ni1000/0.4 m	Ni1000	0.4 m
MWTF Ni1000/3 m	Ni1000	3.0 m
MWTF Ni1000/6 m	Ni1000	6.0 m
Extra charge:	Per meter sensor cable (up to max. 20 m)	
Accessories:	**MF-06-K** Mounting flange, plastic **MK-05-M** Mounting clamps, brass (6 pieces)	

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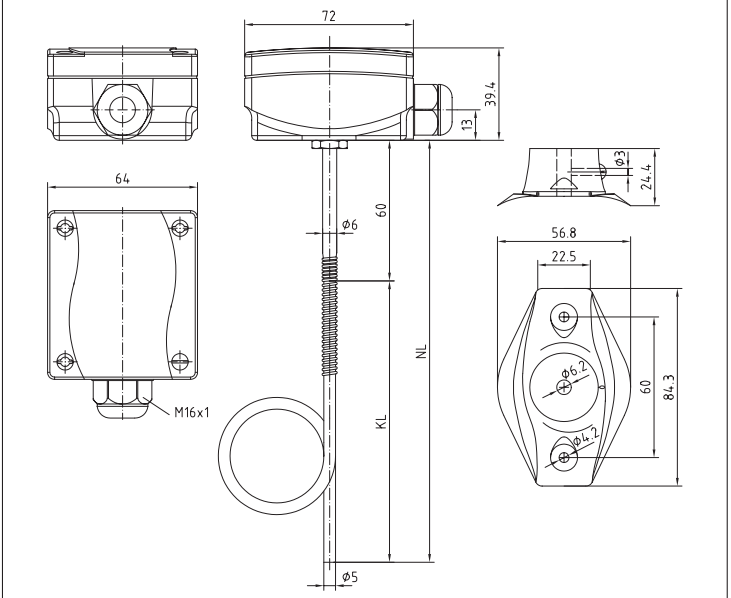
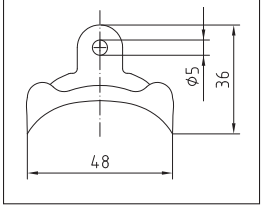
Dimensional drawing

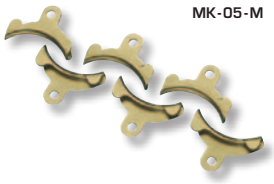
MWTF
MF-06-K



Dimensional drawing **MK-05-M**



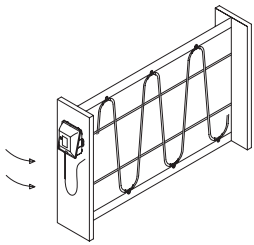
MK-05-M



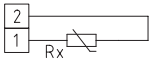
KRD-04

Scheme

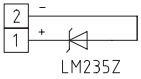
MWTF



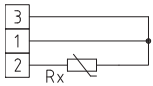
1x two-wire connection
standard



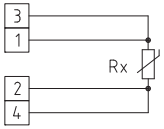
1x two-wire connection
LM235Z (KP10)



1x three-wire connection
(optional)



1x four-wire connection
(optional)



Mounting and Installation

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Devices are to be connected under dead-voltage condition. Devices must only be connected to safety extra-low voltage. Consequential damages caused by a fault in this device are excluded from warranty or liability. Installation of these devices must only be realized by authorized qualified personnel. The technical data and connecting conditions shown on the device labels and in the mounting and operating instructions delivered together with the device are exclusively valid. Deviations from the catalogue representation are not explicitly mentioned and are possible in terms of technical progress and continuous improvement of our products. In case of any modifications made by the user, all warranty claims are forfeited. Operating this device close to other devices that do not comply with EMC directives may influence functionality. This device must not be used for monitoring applications, which solely serve the purpose of protecting persons against hazards or injury, or as an EMERGENCY STOP switch for systems or machinery, or for any other similar safety-relevant purposes.
Dimensions of enclosures or enclosure accessories may show slight tolerances on the specifications provided in these instructions.
Modifications of these records are not permitted.
In case of a complaint, only complete devices returned in original packing will be accepted.

Notes regarding mechanical mounting and attachment:
Mounting shall take place while observing all relevant regulations and standards applicable for the place of measurement
(e.g. such as welding instructions, etc.). Particularly the following shall be regarded:
- VDE/VDI directive technical temperature measurements, measurement set-up for temperature measurements.
- The EMC directives must be adhered to.
- It is imperative to avoid parallel laying of current-carrying lines.
- We recommend to use shielded cables with the shielding being attached at one side to the DDC/PLC.

Before mounting, make sure that the existing thermometer's technical parameters comply with the actual conditions at the place of utilization, in particular in respect of:
- Measuring range
- Permissible maximum pressure, flow velocity
- Installation length, tube dimensions
- Oscillations, vibrations, shocks are to be avoided (< 0.5 g)

Attention! In any case, please observe the mechanical and thermal load limits of protective tubes according to DIN 43763 respectively according to specific S+S standards!

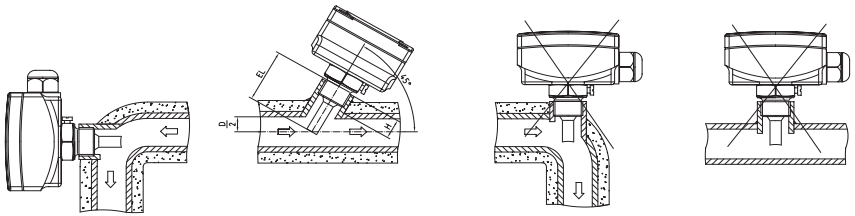
Notes regarding process connection of built-in sensors:
If possible, select material of protective tube to match the material of piping or tank wall, in which the thermometer will be installed!
Maximum temperatures T_{max} and maximum pressures p_{max} are as follows: for TH-MS brass sleeves T_{max} = +150 °C, p_{max} = 10 bar and for TH-VA stainless steel sleeves (standard) T_{max} = +400 °C, p_{max} = 40 bar.

Screw-in threads:
Ensure appropriate support of the gasket or sealing material when mounting!
Permissible tightening torque standard values for screw-in threads, are as follows:
M 18 x 1.5; M 20 x 1.5, pipe thread G 1/2" : 50 Nm
M 27 x 2.0, pipe thread G 3/4" : 100 Nm

Flange mounting:
In case of flange mounting, screws in the flange part must be equally tightened.
The lateral pressure screw must clamp securely, otherwise the feeler shaft might slip through.

Welding sleeves:
Specific welding instructions shall be observed.
On principle, unevenness or the like that might influence the system's "CIP ability" must not develop at welds.
For high-pressure lines, pressure test certifications and inspections are required.

Installation scheme **TH**



General notes

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Measuring principle of HVAC temperature sensors in general:

The measuring principle of temperature sensors is based on an internal sensor that outputs a temperature-dependent resistance signal. The type of the internal sensor determines the output signal. The following active/passive temperature sensors are distinguished:

a) Pt 100 measuring resistor (according to DIN EN 60 751)
b) Pt 1000 measuring resistor (according to DIN EN 60751)
c) Ni 1000 measuring resistor (according to DIN EN 43 760, TCR = 6180 ppm/K)
d) Ni 1000_TK 5000 measuring resistor (TCR = 5000 ppm/K)
e) LM235Z, semiconductor IC (10 mV/K, 2.73 V/°C). Ensure correct polarity +/- when connecting!
f) NTC (according to DIN 44070)
g) PTC
h) KTY silicon temperature sensors

The most important resistance characteristics are shown on the last page of these operating instructions. According to their characteristics, individual temperature sensors exhibit different slopes in the range between 0 °C and 100 °C (TK value). Maximum-possible measuring ranges also vary from sensor to sensor (for some examples to this see under technical data).

Design of HVAC temperature sensors in general:

Sensors are distinguished by shape type as follows: surface-contacting sensors, cable temperature sensors, and enclosure-type and built-in temperature sensors.

- On surface-contacting sensors, the temperature sensor has at least one contact area that must be brought in contact, e.g. with the surface of radiators or pipes. If the contact area is not positioned correctly relative to the surface to be measured, significant temperature measurement errors may occur. Good contact area and temperature conduction must be ensured, dirt and unevenness must be avoided, and heat-conductive paste is to be used where necessary.
- On cable temperature sensors, the temperature sensor is installed inside a sensor sleeve, from which a connecting cable is leading out. In addition to the standard insulating materials PVC, silicone, and fibreglass with stainless steel texture, other versions are also available that may allow a wider range of application.
- On enclosure-type sensors, the temperature sensor is embedded in a respective enclosure. Different designs of enclosures are available, e.g. with an external sensor sleeve (see outside temperature sensor ATF2). Enclosure-type sensors are normally distinguished into in-wall (FSTF) and on-wall (RTF, ATF) types and indoor and wet room versions. Connection terminals are placed on a plate inside the connecting enclosure.
- Duct and built-in temperature sensors are distinguished into temperature sensors with interchangeable measuring insert and without interchangeable measuring insert. Connection parts are placed inside a connecting head. Standard process connection for immersion sensors is a pipe thread (sizes in inches) and a mounting flange for duct sensors. However, it may be designed differently. When a built-in sensor has a neck tube, the application range is usually somewhat wider since ascending heat cannot flow directly and immediately into the connecting head. This is to be noted especially when transmitters are installed. The temperature sensor in built-in sensors is always placed inside the front part of the protective tube. On temperature sensors with short reaction times, protective tubes are stepped.

Note!

Select immersion depth for built-in sensors so that the error caused by heat dissipation stays within the admissible error margins. A standard value is: 10 x diameter of protection tube + sensor length. In connection with enclosure-type sensors, particularly with outdoor sensors, please consider the influence of thermal radiation. For that purpose, a sunshade and radiation protector SS-02 can be attached.

Maximum thermal load on components:

On principle, all temperature sensors shall be protected against unacceptable overheating!

Standard values for individual components and materials selected are shown for operation under neutral atmosphere and otherwise normal conditions (see table to the right).

For combinations of different insulating materials, the lowest temperature limit shall always apply.

Component	max. thermal load
Connecting head type B:	
Aluminium casting with rubber seal	+100 °C
Aluminium casting with silicone seal	+150 °C
"VA" stainless steel part with Teflon seal	+200 °C
Connecting head made of plastic:	
Connecting cable	+100 °C
PVC, normal (PVC, heat-stabilized)	+70 °C (+105 °C)
Silicone	+180 °C
PTFE	+200 °C
Fibreglass insulation with stainless steel texture	+400 °C

Resistance characteristics of passive temperature sensors

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Temp, °C	Pt100 Ohm	Pt1000 Ohm	Ni1000 Ohm	Ni1000 TK5000 Ohm	FeT Ohm	NTC 1 kOhm Ohm	NTC 1,8 kOhm Ohm	NTC 3 kOhm Ohm	NTC 5 kOhm Ohm	NTC 10 kOhm kOhm
-50.0	80.31	803.10	743.00	790.88	-	32,886.00	-	200,338.00	333,914.00	667.83
-40.0	84.27	842.70	791.00	830.83	-	18,641.00	-	100,701.00	167,835.00	335.67
-30.0	88.22	882.20	842.00	871.69	1,934.70	10,961.00	-	53,005.00	88,342.00	176.68
-20.0	92.16	921.60	893.00	913.48	2,030.41	6,662.00	-	29,092.00	48,487.00	96.97
-10.0	96.09	960.90	946.00	956.24	2,127.68	4,175.00	8,400.00	16,589.00	27,649.00	55.30
0.0	100.00	1,000.00	1,000.00	1,000.00	2,226.53	2,961.00	5,200.00	9,795.20	16,325.40	32.65
10.0	103.90	1,039.00	1,056.00	1,044.79	2,327.01	1,781.00	3,330.00	5,971.12	9,951.80	19.90
20.0	107.79	1,077.90	1,112.00	1,090.65	2,429.15	1,205.00	2,200.00	3,748.10	6,246.80	12.49
25.0	109.74	1,097.40	1,141.00	1,113.99	2,480.86	1,000.00	1,800.00	3,000.00	5,000.00	10.00
30.0	111.67	1,116.70	1,171.00	1,137.61	2,533.00	834.20	1,480.00	2,416.80	4,028.00	8.06
40.0	115.54	1,155.40	1,230.00	1,185.71	2,638.60	589.20	1,040.00	1,597.50	2,662.40	5.32
50.0	119.40	1,194.00	1,291.00	1,234.97	2,745.99	424.00	740.00	1,080.30	1,800.49	3.60
60.0	123.24	1,232.40	1,353.00	1,285.44	2,855.23	310.40	540.00	746.12	1,243.53	2.49
70.0	127.07	1,270.00	1,417.00	1,337.14	2,966.36	231.00	402.00	525.49	875.81	1.75
80.0	130.89	1,308.90	1,483.00	1,390.12	3,079.42	174.50	306.00	376.85	628.09	1.26
90.0	134.70	1,347.00	1,549.00	1,444.39	3,194.47	133.60	240.00	274.83	458.06	0.92
100.0	138.50	1,385.00	1,618.00	1,500.00	3,311.56	103.70	187.00	203.59	339.32	0.68
110.0	142.29	1,422.00	1,688.00	1,556.98	3,430.75	81.40	149.00	153.03	255.03	0.51
120.0	146.06	1,460.60	1,760.00	1,615.36	3,552.09	64.70	118.00	116.58	194.30	0.39
130.0	149.82	1,498.20	1,883.00	1,675.18	3,675.65	51.90	95.00	89.95	149.91	0.30
140.0	153.58	1,535.80	1,909.00	1,736.47	3,801.48	42.10	77.00	70.22	117.04	0.23
150.0	157.31	1,573.10	1,987.00	1,799.26	3,929.65	34.40	64.00	55.44	92.39	0.18

Temp, °C	NTC 10 k PRE kOhm	NTC 20 kOhm kOhm	NTC 50 kOhm kOhm	KTY 81-210 kOhm	LM 235Z mVolt
-50.0	441.30	1,667.57	4,168.93	1,068.65	2,232.00
-40.0	239.80	813.44	2,033.61	1,158.95	2,332.00
-30.0	135.20	415.48	1,038.70	1,269.25	2,432.00
-20.0	78.91	221.30	553.24	1,385.15	2,532.00
-10.0	47.54	122.47	306.18	1,508.65	2,632.00
0.0	29.49	70.20	175.51	1,639.60	2,732.00
10.0	18.79	41.56	103.90	1,778.10	2,832.00
20.0	12.26	25.35	63.49	1,924.15	2,932.00
25.0	10.00	20.00	50.00	2,000.00	2,982.00
30.0	8.19	15.89	39.71	2,077.80	3,032.00
40.0	5.59	10.21	25.53	2,238.90	3,132.00
50.0	3.89	6.72	16.80	2,407.60	3,232.00
60.0	2.76	4.52	11.30	2,583.80	3,332.00
70.0	1.99	3.10	7.75	2,767.50	3,432.00
80.0	1.46	2.12	5.42	2,958.80	3,532.00
90.0	1.08	1.54	3.85	3,152.50	3,632.00
100.0	0.82	1.12	2.79	3,363.90	3,732.00
110.0	0.62	0.82	2.05	3,577.75	3,832.00
120.0	0.48	0.61	1.52	3,799.10	3,932.00
130.0	0.38	0.46	1.15	4,028.05	4,032.00
140.0	0.30	0.35	0.88	4,188.10	4,132.00
150.0	0.24	0.27	0.68	4,397.70	4,232.00

Limiting deviation according to classes:

Tolerances at 0 °C:

Platinum sensors (Pt100, Pt1000):

DIN EN 60751, class B ..... ± 0.3 K

1/3 DIN EN 60751, class B ..... ± 0.1 K

Nickel sensors:

NI1000 DIN EN 43760, class B ..... ± 0.4 K

NI1000 1/2 DIN EN 43760, class B ..... ± 0.2 K

NI1000 TK5000 ..... ± 0.4 K

Attention, note!

Testing current influences the thermometer's measuring accuracy due to intrinsic heating and therefore, should never be greater than as specified below:

Standard values for testing current:

Sensor current, maximum ..... I_{max}

Pt100, Pt1000 (thin-layer) ..... < 0.1 - 0.3 mA

Ni1000 (DIN), Ni1000 TK5000 ..... < 2 mA

NTC´s ..... < 1 mA

LM235 ..... 400 µA ... 5 mA

In order to avoid damages/errors, preferably shielded cables are to be used. Laying measuring cables parallel with current-carrying cables must in any case be avoided. EMC directives shall be observed!

These instruments must be installed by authorised specialists only!

Errors and technical changes excepted.

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